



Subjective mortality risk and bequests



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ABSTRACT

This paper investigates the ability of subjective expectations about life expectancy to predict wealth holding patterns in later life. Based on panel data from the Asset and Health Dynamics among the Oldest Old, we estimate a structural life-cycle model with bequests. Each individual's subjective survival rates in the future are estimated with data on his belief of survival probabilities to a target age. This estimation is build upon a Bayesian updating method developed in Gan et al. (2005). We find that life-cycle model using subjective survival rates performs better than using life-table survival rates in predicting wealth holdings. This result suggests that subjective survival expectations play an important role in deciding consumption and savings. In addition, the estimation results show that most bequests are involuntary or accidental.

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1. Introduction

The main goal in this paper is to investigate the empirical relevance of subjective survival rates as determinants of consumption, saving and bequests by the older population. Several previous studies have used life tables (Skinner, 1985; Hurd, 1989; Palumbo, 1999; De Nardi et al., 2010). Yet it is unlikely that each individual has the same beliefs as those summarized by a life table. In this paper, we estimate a life cycle model of Yaari (1965) by using both life tables and individual subjective survival curves. The out-of-sample predictions on assets suggest that individuals' behavior is more consistent with their individual subjective beliefs than life tables.

The model investigated here includes a component of bequest motives as in Yaari (1965) and Hurd (1989). A significant portion of household wealth is passed from one generation to another by bequests. According to Kotlikoff and Summers (1981), 80% of household wealth was inherited. Gale and Scholz (1994) estimate that total bequests were \$105 billion in the US in 1986. Hurd and

Smith (2002) find that the elderly anticipate leaving roughly 40% of their wealth in bequests. Although bequest plays an important role in household wealth accumulation, there is no consensus in the literature on the significance of bequest motives. Some people (Hamermesh and Menchik, 1987; Kotlikoff and Summers, 1981; Kopczuk and Lupton, 2007; De Nardi, 2004; Ameriks et al., 2011) argue that the bequest motive is important while others (Hurd, 1989; De Nardi et al., 2010; Lockwood, 2012) claim that it is economically trivial, and most bequests are accidental or involuntary. The second goal of this paper is to identify bequest motives by comparing the wealth path among those individuals who have children and those individuals who do not have children. We find that bequest motives are very small, indicating most bequests are involuntary or accidental.

This paper applies individual subjective survival rates to estimate a structural life-cycle model of saving and consumption that includes a bequest motive. A large panel data set, the Asset and Health Dynamics among Oldest Old (AHEAD) collected data on people who were born between 1890 and 1923 and their spouses (regardless of age) including information on individuals' expectations of a wide range of future events.¹ Respondents in the survey are asked about their subjective chances of living to a

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¹ See Soldo et al. (1997).

certain age. Earlier work, such as Hamermesh (1985), Hurd et al. (1998), Hurd and McGarry (1995, 2002) and Gan et al. (2005) (GHM hereafter) have studied the relationship between subjective probabilities and actual survival rates.² These papers have found that, on average, individual subjective survival probabilities are consistent with life tables, varying appropriately with known risk factors and having predictive power for actual mortality beyond that contained in a life table. Therefore, there is important information content in these responses on subjective survival probabilities. A remaining question is whether individuals behave as they respond to the survey questions.

Individual subjective survival rates are obtained by respondents self-report about their belief of survival probabilities to target ages. However, the subjective survival probabilities have serious focal response problems: many individuals tend to give responses of 0.0 and 1.0. These focal responses cannot be directly used in analyzing life-cycle models where survival probabilities are required. To eliminate focal biases, GHM suggest a Bayesian updating method. For each individual in the AHEAD data set, GHM estimate an “optimism” index. Compared to the life table survival probability, an individual may overestimate or underestimate his/her survival probability. The estimated “optimism” indices show significant individual heterogeneity, and can be applied to derive individuals’ subjective survival probabilities without focal biases. The individualized survival curves developed in GHM are used to estimate a life cycle model with bequests in this paper.

Understanding people’s bequest motives is very important for public policies. Kotlikoff (1988) asserts that inherited wealth plays an important and perhaps dominant role in US wealth accumulation. Bequests may hold a key answer to the social security problem that baby boomers may face: they may eventually receive significant estates from their parents such that their dependence on social security may be reduced.

Predicting whether a large portion of wealth will be passed from one generation to the next generation requires knowledge of the motives for bequests.³ As pointed out in the literature (Hamermesh and Menchik, 1987; Kotlikoff, 1988; Hurd, 1989), a large amount of bequeathed wealth does not necessarily imply a substantial motive for bequests. Without a well-functioning annuity market, people will have to save against mortality risk, and the resulting bequests could be involuntary.⁴ If most bequests are in fact involuntary or accidental, the value of the bequeathed wealth may decrease in the future as the annuity market further develops.⁵ In addition, it is also possible that people may change their perceptions of stock market risks after the recent financial crisis. In that case, more people may move into annuities, and the total amount of bequeathed wealth will decrease.

The rest of the paper is organized as follows. In Section 2, we introduce a life-cycle model with bequests. Our emphasis is on how to estimate such a model. Section 3 presents the estimation results. In particular, Section 3.1 introduces the data that will be used in

the paper. Three key variables are used in the empirical variables: wealth, income and subjective survival probabilities. In Section 3.2, we present parameter estimates based on various estimation methods. Section 3.3 calculates the bequest incentives based on estimates from Section 3.2. In Section 3.4, we conduct out-of-sample predictions and simulate the consumption and wealth trajectories under various sets of parameter estimates. Finally, we summarize the results of this paper in Section 4.

2. The model

Our starting point is the standard life-cycle model with bequests as in Yaari (1965) and Hurd (1989). Let the utility function of a retired individual be:

$$\sum_{t=0}^N \beta^t U(c_t) s_t + \sum_{t=0}^N \beta^t B(w_{t+1}) m_{t+1} \quad (1)$$

where s_t is the subjective probability that the individual will be alive at time t . m_{t+1} is the subjective mortality rate at time $t + 1$: $m_{t+1} = s_t - s_{t+1}$. The subjective maximal number of periods an individual can survive is N . The time discount factor is denoted as β . Consumption at time t is denoted as c_t , and wealth at the beginning of time t is denoted as w_t . The first term in (1) is the present value of utility from consumption conditional on survival; and the second term in (1) is the present value of the utility from leaving a bequest of w_{t+1} conditional dying at $t + 1$. The utility from a bequest, $B(w_{t+1})$, is increasing in w_{t+1} .

This model only applies to singles. The corresponding model for couples is much more complicated because it has to account for bequeathing by a couple to the next generation, and also for providing to a surviving spouse.⁶

As in Hurd (1989), we further assume a borrowing constraint such that bequeathable wealth cannot become negative. The constraint imposed on borrowing indicates that future Social Security benefits cannot be used as collateral for a consumption loan. This constraint arises from the fact that all heads of households in the sample are older than 70 years old in 1993 when the survey started, and in the US, Social Security benefits cannot be used as collateral. Such a constraint imposes an important boundary condition in our analysis:

$$w_t = (1 + r) w_{t+1} + A_{t-1} - c_{t-1} \geq 0 \quad (2)$$

where w_t is the wealth accumulated at the end of time $t - 1$ and A_{t-1} is annuity income at time $t - 1$.

It is typical in this literature to assume a constant risk aversion utility function $U(c_t) = c_t^{1-\gamma} / (1 - \gamma)$. Income from annuities such as Social Security is assumed to be constant. The marginal utility of a bequest, denoted as α , is dependent on how many children the person has:

$$B_w \equiv \alpha \equiv \frac{\partial B}{\partial w} = 1_{\text{children}} (\alpha_0 + \alpha_1 * \text{No. of children}), \quad (3)$$

where 1_{children} is an indicator function. The assumption that the bequest motive exists only if the person has any children is important to identify the model. Otherwise, the identification may only come from the functional form assumptions.⁷ Besides the identification advantage, this simple specification is chosen for two reasons. First, despite the potential presence of bequest motive, there is little empirical evidence of a more complex

² Hamermesh (1985) was the first to investigate how people’s subjective survival probabilities are related to life tables and what the implications of the subjective probabilities are.

³ Various incentives for bequest are offered in the literature. Some argue that bequests serve as incentives to younger generations to provide appropriate care for older generations (Cox, 1987; Bernheim et al., 1985). Others argue that bequests are mainly motivated by altruism.

⁴ One reason of the little presence of private annuity market in the US, as argued in earlier papers by Friedman and Warshawsky (1988, 1990), and later by Mitchell et al. (1999), is because the present value of annuity payout is significantly lower than that of annuity premium, although Mitchell et al. (1999) show a large reduction in the difference between the payout and the premium in 1990s.

⁵ Poterba (1997) documents that variable annuity premium payments increased by a factor of five during the period 1988–1993.

⁶ Estimating the couple’s bequest motive is our next research objective.

⁷ Kopczyk and Lupton (2007) examine the possible unobserved heterogeneity in bequest motives.

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